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Research Article

TRANSCATHETER EMBOLIZATION IN THE SPOTLIGHT: A COMPREHENSIVE EVALUATION OF SUPERSELECTIVE MESENTERIC ARTERIAL EMBOLIZATION FOR MANAGING LOWER GASTROINTESTINAL BLEEDING

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ABSTRACT

SMAE was evaluated as a tool for managing lower GI bleeding (LGIB) using digital subtraction angiography (DSA). Our health service treated patients with LGIB in a retrospective manner with SMAE. In patients with confirmed active LGIB on radionuclide scintigraphy or contrast-enhanced multidetector CT angiography, DSA was combined with SMAE if it was confirmed either on radionuclide scintigraphy or on CE-MDCT. Among the information collected by the study was patient characteristics, screening methods, bleeding zones, embolization techniques, technical and clinical success of the procedure, complications during the short- to medium-term and the long-term, mortality after one month, and progression to surgery when the procedure failed or developed complications. An analysis of 110 admissions to hospitals with acute stable lower gastrointestinal bleeding was conducted over a month period, as demonstrated by CE-MDCT or RS. An embolization procedure is performed on 36 patients, with immediate success for all. Clinical rebleeding occurred in 16 patients following intervention, requiring repeat imaging. Radiological rebleeding was detected in only 2 case, which was embolized. Complications were low: no bowel ischaemia, constriction, or death within month. The initial management of localised LGIB is SMAE. It is safe, effective, and feasible. Compared to other institutions' published experiences, our results are generally positive. In our institution, embolization is the standard approach to treating localized LGIB.

Keywords: - Digital subtraction angiography, CT angiography, embolization techniques, radionuclide scintigraphy.

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INTRODUCTION

Twenty to twenty-four percent of gastrointestinal bleeding occurs from sources distal to the ligament of Treitz. A recent study showed that angiodysplasia, colitis, and neoplasia all contribute to the incidence of LGIB in adults, which increases with age [1, 2].

Most cases of severe LGIB can be treated with endoscopic and angiographic interventions without surgery. Colectomy can be performed in three ways: directly, blindly, or sub-totally. When conservative, endoscopic, or endovascular measures have failed to stabilize a patient, this procedure may be considered. In elderly patients with medical comorbidities, blind segmental and subtotal colectomy is associated with an increased mortality rate [3].

Super-selective embolization of LGIB has recently become a treatment option offered by Western Health, a multi-center institution in Melbourne (Australia). In some cases, endoscopy can be used instead of surgery.

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Radionuclide scintigraphy (RS) or computed tomography with contrast enhancement (CE-MDCT) are performed on patients who present with severe LGIB that is unstable. An investigation and possible intervention are performed in the digital subtraction angiography (DSA) suite following identification and localisation of active bleeding. Our study reviews the experience our institution has had with arterial embolization of LGIB and compares it to a growing body of evidence.

METHODS

In this study, super-selective embolization is used to treat patients presenting with LGIB. All patients undergoing angiogram after confirmation of LGIB (on RS or CE-MDCT) were included in the study. Afterwards, all patients who had bleeding were treated with endovascular procedures. Excluded were patients whose bleeding originated elsewhere. The main campus is where interventions radiological services are concentrated, and patients with LGIB are transferred there immediately when they require immediate treatment.

The medical records of identified patients were reviewed after they were identified. It included patient characteristics such as age, gender, and comorbidities, screening methods (RS and CE-MDCT), bleeding territory, embolization technique, technical success, clinical success, short-term and medium-term complications such as infarctions, ischaemia-related strictures, and mortality up to one month, as well as surgery resulting from complications or procedural failure.

As demonstrated on DSA after deployment of the embolizing agent, technical success was defined as the cessation of contrast extravasation. In order to define clinical success, the patient's vital signs had to be normalized and no more fluid resuscitation was required. No radiologically demonstrated LGIB was noted following the transfusion of one unit of packed red blood cells. One-month follow-up was achieved for all cases, and a 6-month follow-up was achieved for all cases completed.

RESULTS

Acute unstable lower gastrointestinal bleeding was demonstrated on CE-MDCT or RS for 110 hospital. In each case, endovascular intervention was planned before proceeding to DSA.

An individual with pancytopenia and dissociated intravascular coagulation was excluded because of pan-gastrointestinal bleeding. There was significant bleeding in the terminal ileum that was successfully controlled by micro-coil embolization. Hepatic failure ultimately led to the death of this patient. 36 of the 10/ remaining LGIB cases with DSA had endovascular interventions. There was a 2:1 ratio of males to females in these 36 cases. Age ranged from 60 to 93 years. On DSA, none of the remaining 72 patients demonstrated active bleeding, so there was no need for endovascular intervention. Aspirin alone was used by 12 patients, aspirin and clopidogrel by 6, and aspirin and clopidogrel by 2 patients. In situ mechanical heart valves were the indication for warfarin. Following recent coronary artery stent implantations, patients were prescribed clopidogrel, while aspirin was prescribed as a preventative measure. The demographics and comorbidities of patients are summarized in Table 1.

Table 1: Demographic profile.

Characteristics	Number
Based on gender	
Males	24
Females (ii)	12
Age median	38.25 (range: 60–93)
Anticoagulant therapy	
(i). Taking aspirin	12 (33%)
(ii). Clopidogrel and aspirin	6(17%)
(iii). Anticoagulant	2 (6%)

In all cases except four, embolization took place within 24 hours of admission. A periprostatic abscess caused secondary rectal bleeding in one of the exceptions. It was necessary to intervene actively when this patient's bleeding gradually worsened. Another case involved embolization of a perforated sigmoid colon following Hartmann's surgery more than 24 hours earlier. A total of 18 additional cases were found to be due to diverticular disease, two due to angiodysplasia, 4 due to inflammation, 4 due to iatrogenic causes, 2 due to haemorrhoidal infection, 2 due to infection, and 2 due to unknown causes. Blood was found in a terminal ileum resulting from CMV proctitis and in a rectal ulcer with no cause evident from records.

The majority of bleeding cases were scanned with CE-MDCT, while ten received radionuclide scans

and four required both. Across both lower gastrointestinal tract vascular territories, the distribution was even. Following repeated IMA studies without a bleeding point being identified, a mid-rectal artery (iliac artery branch) was identified as the source of the CMV rectal ulcer bleed.

Four cases required additional Gel-Foam embolization due to microcoil embolization as the preferred agent. Every one of the 36 cases achieved immediate haemostasis after embolization. A DSA after embolic agent deployment showed no further extravasation of contrast. Within a month of initial intervention, 16 patients had clinically significant rebleeding requiring repeated imaging; six required CT angiograms, six required radionuclide scintigraphy, and four required DSA. Two patient (interestingly, a DSA-evaluated case) required further embolization when repeat imaging demonstrated rebleeding.

Rebleeding was not controlled by surgery in any case. Thirty-day mortality was not observed. Follow-up colonoscopy, subsequent hospital admission, and outpatient review did not reveal a stricture in the intervertebral segment.

DISCUSSION

Blood transfusions are required in cases of acute LGIB if the bleeding lasts less than three days [2]. As opposed to chronic LGIB, which is defined as bleeding lasting more than 3 days and accompanied by iron-deficient anemia, chronic LGIB encompasses both occult and obscure bleeding. It has been determined that 40% of patients with acute LGIB suffer from diverticulosis, 30% have vascular ectasia, 20% have colitis (inflammatory, ischaemic and radiation), 14% have colonic neoplasia, and 10% suffer from anorectal causes [8]. The majority of cases of LGIB will not require immediate investigation or intervention because bleeding will stop spontaneously in 80–85% of cases. It may be necessary to perform therapeutic procedures on patients with ongoing active bleeding, regardless of whether their haemodynamics are compromised. Embolization for acute LGIB has been studied at a single institution.

Among the first-line treatments for LGIB, colonoscopy has been recommended. In addition to being diagnostic, this test has an accuracy rate of 72–86% [1, 3] and a yield of 89–97% [2, 3]. Furthermore, various haemostatic techniques can be used where appropriate [3, 8]. An ideal preparation for the procedure would be to cook the patient's bowels prior to the procedure to facilitate visualisation. However, an unstable patient with significant hemorrhage might not be able to do so. Alternatively, a bleeding point may be identified using radiology with an endovascular approach to follow. It is possible to localize LGIB using three techniques: CT and MRI angiography with contrast enhancement, radionuclide scintigraphy, and digital subtraction angiography. Once a diagnosis is established, angiograms allow for treatment during the same process. Based on a sample size of at least 1.0 ml/minute, the test has 100% specificity, but a sensitivity of just 30–47%. Diagnostic yield ranges from 41 to 78%. In stable patients, scintigraphy poses limited benefits due to longer study times and a reduced diagnostic yield with brisk bleeding since it has a high sensitivity rate and can detect bleeding rates as low as 0.1 ml/minute. In recent years, CE-MDCT has demonstrated sensitivity and specificity for detecting bleeding rates of 0.3-0.5 ml/min [2, 3]. LGIB can be treated with angiographical intervention since the 1970s, when the first attempts were made. Bowel infarctions caused by nonselective embolization were common during this period. When technology improved in the 1990s, it emerged as a viable alternative. As coaxial microcatheters developed, it became possible to deliver embolic materials close to the bleeding site via super-selective catheterization of specific marginal arteries and vasa recta. This drug was able to reduce bleeding from collateral vessels and reduce the risk of infarction. In diverticular bleeding, more bleeding control is achieved at 30 days by super-selective embolization than none in non-diverticular bleeding [10]. It is possible to develop strictures due to ischaemia after angiographic treatment. After angiographic treatment, there may be complications such as bowel infarction, rebleeding, or rebleeding. The blood passing from the rectus can still be altered even after bleeding has stopped in patients with LGIB up to 1 week after the bleeding has stopped.

Waugh et al. [7] reviewed 27 embolization cases over 63 months. 26 cases were technically successful and 19 cases were clinically successful with 6 cases requiring repeat embolization. Two deaths were associated with surgical complications associated with the resection of the ischaemic segment in two cases with clinical symptoms of ischaemia. An ischaemia case and an ongoing LGIB case progressed to surgery due to multiple attempts at embolization. This study did not include ischaemic stricture as an endpoint.

In a study by Tan et al. [6], 32 patients at a large teaching hospital in Singapore were studied over 82 months for mesenteric embolization. The study was technically successful in 31 cases, but clinically successful in only 20. The remaining case, due to metastatic disease, was managed conservatively due to underlying embolization, colonoscopy, and surgery in four of the cases. As a result of ischaemia, 3 cases were treated with bowel resections by their treating surgeons, despite having no rebleeding. LGIB and ischaemia were the only indications for surgery in only 5 cases. One of the cases in this series was directly related to intervention, but there were three mortalities in this series. There were no reports of ischaemic stricture.

In the third series, Rider et al. [5] reported 24 cases over a period of two years from the Ochsner Clinic. All cases were technically successful. A sigmoid colectomy was required in one case after the bleed rebled and reembolization failed. In two cases, segmental colectomy was necessary due to ischaemia. The study did not result in any deaths. The case of one patient required surgery due to ischaemic stricture.

The efficacy of super-selective mesenteric embolization following radiological localisation has been demonstrated in the management of acute unstable LGIB.

According to our study, when comparing the proportions of patients with postembolization ischaemia, those who went on to surgery, the mortality rate after month, and those who developed ischaemic structure following embolization.

Compared with Rider et al.'s and Tan et al.'s studies, our study saw a higher proportion of patients who failed embolization or required repeat embolization, but lower than Waugh et al.'s.

We have adopted a protocol to diagnose all acute unstable LGIBs using CE-MDCT after resuscitation and stabilization based on the positive preliminary results. As a retrospective case series study, this study has a number of limitations as well as having a small cohort of patients. Therefore, no statistically significant conclusions can be drawn from it. In light of our findings, it is recommended to continue research with prospective recruitment of cases and follow-up in accordance with a defined protocol in the future.

CONCLUSION

Super-selective mesenteric embolization is an effective method of treating localised LGIB. Compared to published experiences of other institutions, our results are generally favorable. Our institution now practices embolization as a method for treating localised LGIB.

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